

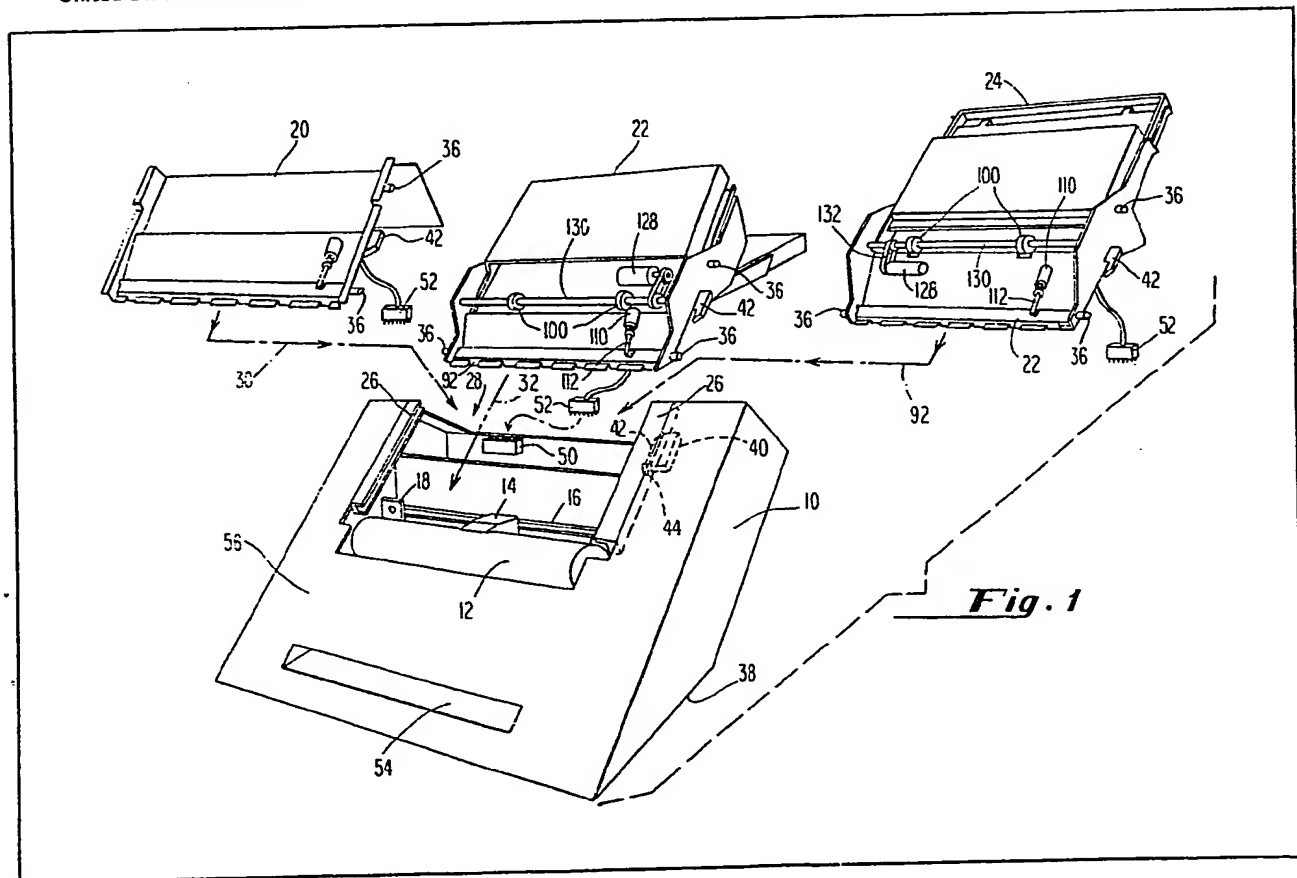
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(54) Sheet feeding in facsimile apparatus

(57) A facsimile apparatus has a common base unit 10 adapted to receive a plurality of sheet feeding systems 20, 22, 24 of different configurations. Any one of the systems 20, 22, 24 may be mounted on the base unit 10 at one time by sliding the selected system into receiving means comprising inclined tracks 26. Electrical interlock means include switch 40 on base unit 10 and cam members 42 on systems 20, 22, 24.



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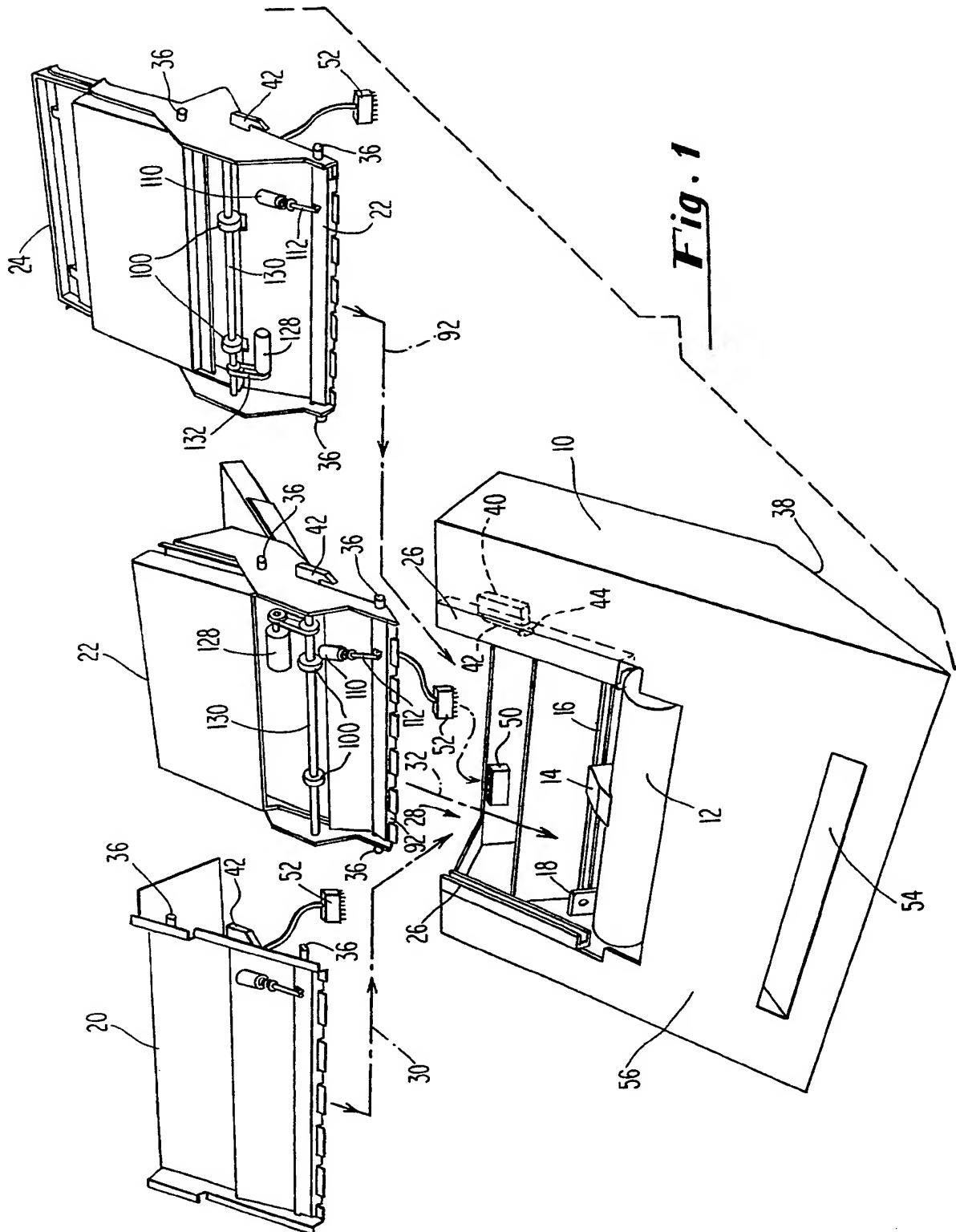


Fig. 1



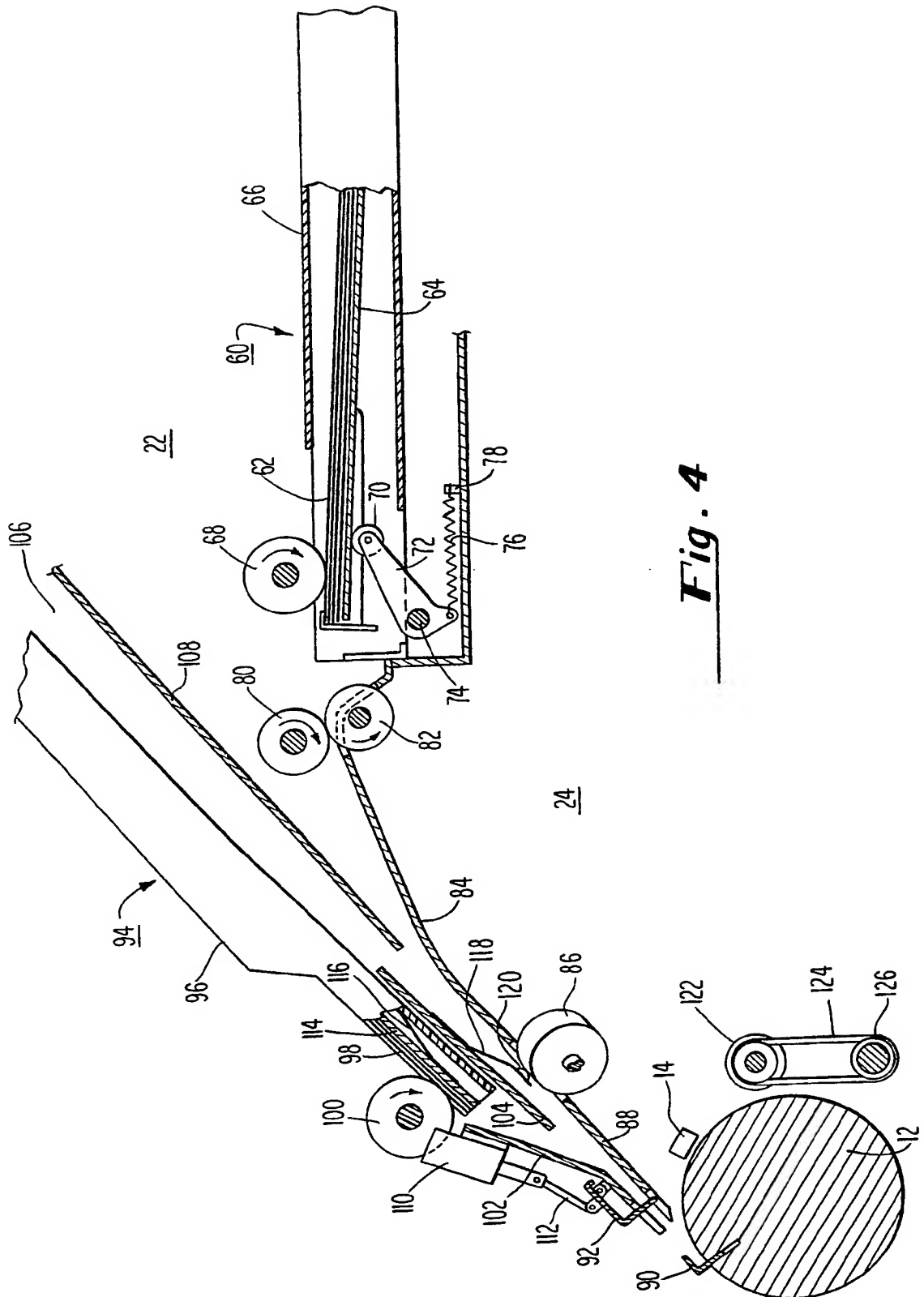


Fig. 4

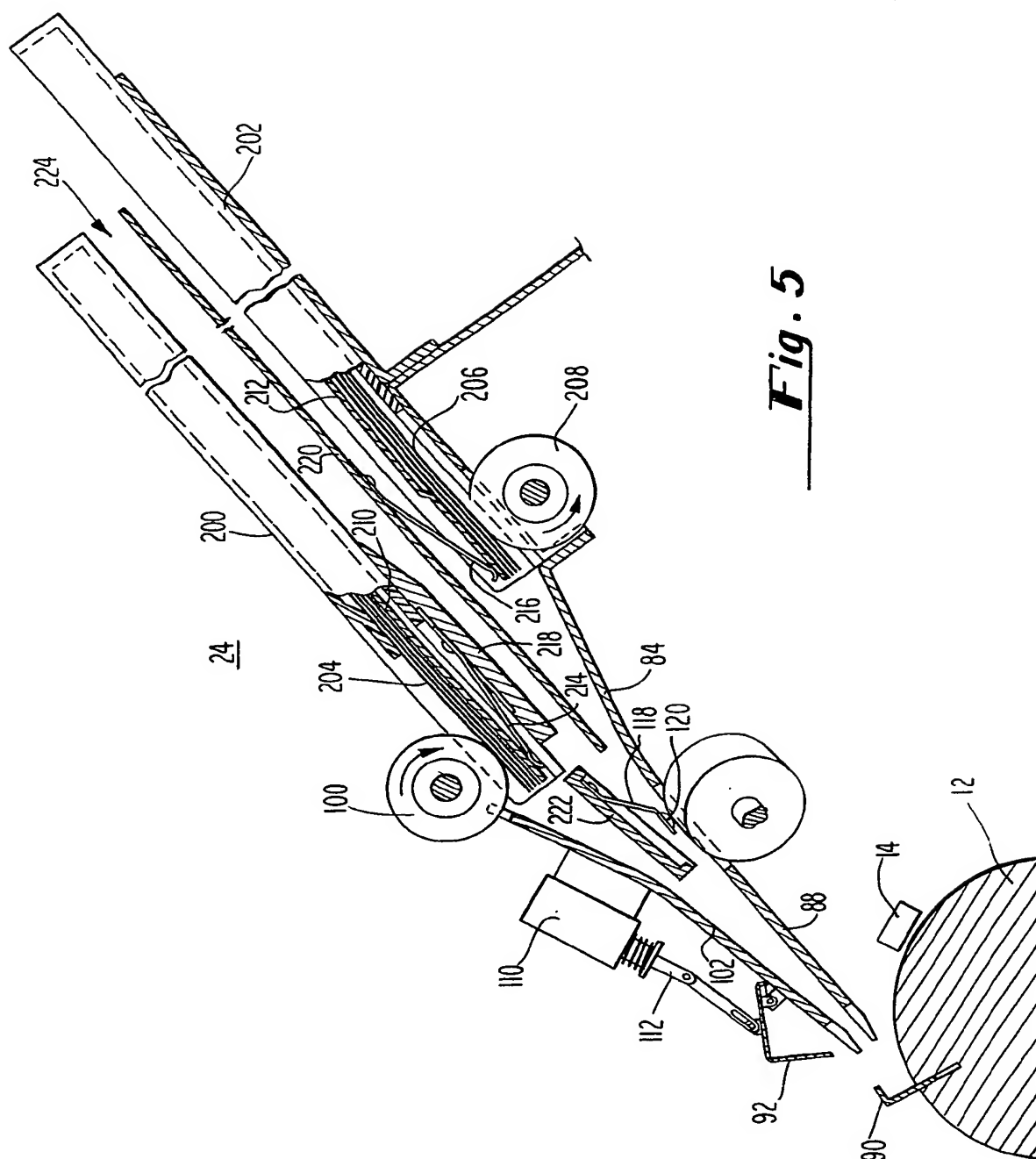


Fig. 5

SPECIFICATION

Facsimile apparatus

Background of the Invention

This invention relates to the facsimile transmitters and/or receivers of the type utilized to transmit and/or receive information-bearing signals representing the dark/light variations on a document located at a transmitter and converting the information-bearing signals to marks or images on a copy medium located at a receiver so as to form a copy which is a reasonable facsimile of the original document.

Most facsimile transmitters and receivers in commercial use at the present time are supplied with document or copy medium sheets by hand. In other words, an operator takes an individual sheet of paper, whether the individual document or a blank piece of copy medium, and places that sheet on or in the scanning means of the transmitter or receiver, typically a drum having a clamp for clamping one edge of the sheet.

In other facsimile transmitters and receivers in commercial use today, provisions are made for automatically feeding a document or copy medium so as to permit the transmitter or receiver to operate in an unattended mode. Such transmitters and receivers are typically extremely expensive and are utilized only by users of the transmitter or receiver for large numbers of facsimiles. These users are therefore separate and distinct from and require equipment substantially more elaborate than the hand fed system most often utilized in the facsimile market. Even the more elaborate and expensive facsimile systems vary in their capabilities thus making some systems more attractive to some users and other systems more attractive to other users.

Summary of the Invention

It is an object of this invention to provide a method and apparatus for readily changing the sheet feeding capability of facsimile equipment so as to satisfy the various needs of different customers.

It is a more specific object to provide the foregoing capability while minimizing the cost to each of the users.

In accordance with the foregoing objects, a preferred embodiment of the invention comprises a facsimile apparatus including a common base unit including scanning means for scanning the sheet of material and means for receiving a sheet feeding apparatus. The apparatus is adapted to receive sheet feeding systems of different configurations interchangeably on the base unit.

In accordance with one important aspect of the invention, the means for receiving comprises a guide means for guiding the various sheet feeding systems. The guide means may comprise at least one track in each of the sheet feeding systems includes at least one member adapted to be received by the track. Electrical interlock means carried by the base unit and the sheet feeding systems may also be provided.

Brief Description of the Drawing

Figure 1 is a perspective view of a preferred embodiment of the invention including a base unit and a plurality of sheet feeding systems;

Figure 2 is a sectional view of a track and electrical interlock mechanism associated with a base unit and any one of the sheet feeding systems shown in Figure 1;

Figure 3 is a sectional view taken along line 3—3 of Figure 2;

Figure 4 is a sectional view of one of the sheet feeding systems shown in Figure 1;

Figure 5 is a sectional view of another of the sheet feeding systems shown in Figure 1; and

Figure 6 is a sectional view of yet another of the sheet feeding systems shown in Figure 1.

Description of a Preferred Embodiment

Referring to Figure 1, a facsimile apparatus comprises a base unit 10 comprising scanning means including a rotatable drum 12 and a head 14 adapted to move in a substantially linear direction parallel with the axis of the drum 12. The head 14 is driven by a band 16 which forms a closed loop. One end of the band 16 wraps around a pulley (not shown) which is mounted on a support 18.

In accordance with this invention, the base unit 10 comprises means for interchangeably receiving a plurality of different sheet feeding systems 20, 22 and 24. The receiving means includes guide means in the form of a pair of tracks 26 located on opposite sides of an opening 28 in which the various sheet feeding systems 20, 22 and 24 are mounted as depicted by arrows 30, 32 and 34 associated with respective sheet feeding systems. Each of the sheet feeding systems 20, 22 and 24 includes lugs 36 adapted to be received by each of the tracks 26.

In accordance with another important aspect of this invention, the tracks 26 are inclined with respect to the plane of a base supporting surface 38 since inclination of the tracks 26 facilitates the mounting of each of the sheet feeding systems 20, 22 and 24. Moreover, the inclination of the tracks 26 allows a sheet feeding path to be inclined with respect to the plane of the supporting surface 38 which is of assistance in automated sheet feeding.

In accordance with another important aspect of this invention, the base unit 10 as well as the various sheet feeding systems 20, 22 and 24 include electrical interlocking means. The base 10 comprises interlocking means including a switch 40 located adjacent one of the tracks 26. Each of the sheet feeding systems 20, 22 and 24 include cam members 42 which are adapted to engage a small roller 44 on the end of a spring arm 46 as best shown in Figures 2 and 3. As also shown in Figures 2 and 3, the lugs 36 are adapted to move through the tracks 26 just above the interlock switch 40. As also shown in Figures 2 and 3, the lugs 36 are mounted on a side wall 48 of one of the sheet feeding systems 20, 22 and 24. In Figures 2 and 3, a sheet feeding system 20 has been illustrated.

In accordance with another important aspect of this invention, the base unit 10 includes a receptacle 50 which is adapted to mate with a plug 52 of one of the sheet feeding systems 20, 22 and 24. Once the plug 52 for one of the sheet feeding systems 20, 22 and 24 is mated with the receptacle 50, electrical energy in control signals are applied from the base unit 10 to the particular interconnected sheet feeding system. Of course, the plug 52 could just as well be mounted on the base 10 and the receptacle 50 mounted on the various sheet feeding systems 20, 22 and 24.

Each of the sheet feeding systems 20, 22 and 24 applies a sheet to a rotatable drum 21 prior to scanning the sheet by the head 14. Once scanning is completed, the sheet is stripped from the drum 12 and is then free to exit through a slot 54 on the inclined forward facing surface 56 of the base 10.

The system shown in Figure 1 is capable of operating as a facsimile transmitter or receiver regardless of which of the particular sheet feeding systems 20, 22 and 24 is inserted in the tracks 26. Accordingly, each of the sheet feeding systems 20, 22 and 24 must be capable of supplying documents to the drum 12 or copy medium to the drum 12 depending upon the mode of operation required by the user. Details of how the various sheet feeding systems 20, 22 and 24 supply documents and/or copy medium to the drum 12 the various configurations of the sheet feeding systems 20, 22 and 24 will now be described in more detail.

Referring first to Figures 1 and 4, the sheet feeding systems 24 will be described in detail. The system 24 comprises a sheet storage area 60 which is adapted to receive a stack of copy media sheets 62 which are supported on a plate 64. The stack 62 is housed with a cassette-like container 66.

The upper most sheet in the stack 62 is engaged by a scuff roller 68 in the forward area of the stack 64 so as to pull the upper most sheet from a stack 24 in a direction directly parallel with the upper most plane of the stack 62. In order to assure that the upper most sheet in the stack 62 is in engagement with the scuff roller 68 at all times, plate 64 is driven upwardly by a roller 70 mounted on the end of an arm 72 which is rotated about a mounting 74 as a result of a bias supplied by a spring 76 attached to a stationary peg 78.

Once the upper most sheet of the stack 62 is pulled in the forward direction to a point of engagement between the drive rollers 80 and 82, the opposite rotation of the rollers 80 and 82 as depicted by the arrows located on the rollers in the drawing of Figure 4 will advance the sheet down a chute 84. When the sheet reaches the roller 86 which is canted such that the axis of the roller 86 forms an angle with a line perpendicular to the travel of the sheet, the roller 86 will advance the sheet down into the segment 88 of the chute to an open clamp 90 secured to the drum 10. During the travel of the sheet from the sheet storage area 60, a gate 92 (shown in Figure 4 as closed) is opened.

In order to feed documents to be transmitted to the drum 12, the document storage area 94 is provided with a document cassette 96. The cassette 96 contains a bundle of documents 98 which may be separated by plastic sheets having openings adapted to permit scuff roller 100 to contact the document 98, one at a time, to advance those documents between a one guide 102 and another guide 104 toward the segment 88 of the chute 84. The documents 98 continue to be driven by the roller 100 past an open gate 92 to the open clamp 90.

In addition, sheet feeding system 24 provides a single sheet feeding capability for an operator who may insert a sheet into an opening 106 and push the sheet along a guide 108 toward the cammed roller 86. Canted roller 86 may then advance the sheet to the closed gate 92 until the drum 12 is ready to receive the sheet with the clamp open. At that time, the gate 92 is raised by a solenoid 110 mounted on the guide 102 by means of a suitable linkage 112.

Shown in Figure 4, sheets 98 are supported on a plate 114 which is biased upwardly by spring 116 so as to assure that the upper most document in the cassette 96 is in contact with the roller 100. A spring 118 is mounted on the guide No. 104 so as to assure substantial and frictional engagement of a sheet between the cammed roller 86 the contact point 120 mounted on the end of the lease spring 118.

As also shown in Figure 4, a roller 122 is located adjacent to the surface of the drum 12 and driven by a belt 124 connected to a driven pulley 126. Roller 122 is adapted to move into and out of engagement with a sheet supported by the surface of the drum 12 so as to strip the sheet from the drum 12 when scanning has been completed to allow the sheet to pass through the slot 54 the base unit 10 is shown in Figure 1. Also shown in Figure 1, a pair of rollers 100 is provided for engagement with the upper most sheet in the cassette 96. The rollers 100 are driven by a motor 128 which is coupled to a shaft 130 supporting the rollers 100 by a belt 132.

It will therefore be appreciated that the sheet feeding system 24 shown in Figures 1 and 4 is a particular configuration capable of feeding documents in a stack from a cassette 96 in an unattended manner, a copy media in a stack from a cassette 66 in an unattended manner and a single document or a single copy medium handled by an operator through the opening 106. In the configuration of the system of Figure 4, a substantial volume of documents and copy media may be handled in a variety of ways so as to provide a particular user with a particular type of equipment.

Reference will now be made to Figures 1 and 5 for a discussion of yet another sheet feeding configuration. To some extent, various components of the sheet feeding system shown in Figures 1 and 5 are substantially identical to certain components of the sheet feeding system of Figures 1 and 4 such components will therefore be

identified with the same reference characters for the sake of clarity. Only those components and functions which differ from those described with reference to the sheet feeding system 12 of Figures 1 and 4 will be described hereafter.

5 As shown in Figure 5, a document transmitting cassette 200 is provided for documents which are adapted to be engaged by the roller 100. A receiving or copy media cassette 202 is provided
10 immediately below the cassette 200. Each of the cassettes 200 and 202 are oriented opposite directions, i.e., cassette 200 is facing upwardly such that the upper most sheet 204 faces
15 downwardly such that the lower most sheet 206 in the cassette 202 is engaged by a scuff roller 208. Each of the sheets 204 and 206 may be separated by a plastic divider so as to assure that a single sheet at a time is advanced by the rollers 100 and 208. Sheets 204 and 206 are backed
20 respectively by plates 210 and 212 which are biased toward the rollers 100 and 208 respectively. Leaf spring 118 is mounted on an abbreviated member 222 above the cammed roller 86.

25 In addition to the unattended multi-sheet feed capability from the cassettes 200 and 202, a single sheet or hand-fed capability is provided through an opening 224 between the cassette 200 with the associated member 218 and the
30 member 220. When inserting sheets through the opening 224, gate 92 is in the closed position similar to that illustrated in Figure 4.

It would, therefore, be appreciated that the sheet feeding system 24 has now been described
35 as characterized by a particular configuration which allows a certain amount of unattended sheet feeding from document and copy media cassette while also permitting single sheet feeding of documents and copy media for transmitting or
40 receiving purposes. While some of the same functions are provided by the sheet feeding system 24 as are provided by the sheet feeding system 22, it will be understood that the sheet feeding system 22 has a substantially greater
45 capacity for copy media sheets and feeds the copy media sheets from a different position than does the sheet feeding system 24 of Figure 5.

Reference will now be made to Figures 1 and 6 for a description of a single sheet or hand-fed sheet
50 feeding system. Shown in Figure 6, the system 20 includes the canted roller 86 which cooperates with a contact area 300 carried by a spring 302 mounted on a guide member 304. As a sheet in the form of a document or a copy media is
55 inserted between the member 304 and the guide 306 so as to be contacted by the roller 86 at the contact area 302, the sheet is advanced to a close gate 92 under the control of a solenoid 110. The gate 92 is then opened so as to permit the sheet
60 to advance to an open clamp 90 when the open clamp 90 is in the position shown in Figure 6. Clamp 90 then closes and wraps the sheet around the drum 12 at which time the gate 92 also closes to prevent a document from passing the gate 92.
65 From the foregoing, it will be appreciated that the

sheet feeding system 20 is capable of feeding a single sheet at a time and at the same time providing the capability of maintaining a sheet in a state of readiness at the gate 92 for feeding to
70 drum 12 as soon as the clamp 90 is opened and in the position shown in Figure 6. This configuration, of course, substantially differs from the configuration of the sheet feeding systems 22 and 24 shown in detail in Figures 4 and 5.

75 Although specific sheet feeding systems have been described, it will be appreciated that a variety of sheet feeding systems of differing configurations may be employed in connection with the base 10 in accordance with this
80 invention. Other modifications and alternatives will occur to those of ordinary skill of the art which fall within the true spirits and scope of the invention as set forth in the appended claims.

CLAIMS

- 85 1. Facsimile apparatus comprising:
a common base unit including scanning means for scanning a sheet of material and means for receiving a sheet feeding apparatus;
a first sheet feeding system having a first sheet
90 feeding configuration;
a second sheet feeding system having a second sheet feeding configuration differing from said first sheet feeding configuration;
said first system and said second system being
95 interchangeable mounted on said means for receiving a sheet feeding apparatus.
2. The facsimile apparatus of Claim 1 wherein said means for receiving comprises a guide means for guiding said first system and said second
100 system.
3. The facsimile apparatus of Claim 2 wherein said guide means comprises at least one track, said first system and said second system each including at least one member adapted to be
105 received by said track.
4. The facsimile apparatus of Claim 1 further comprising electrical interlock means including a first interlocking means carried by said base unit and a second interlocking means carried by said
110 first system and said second system.
5. The facsimile apparatus of Claim 4 wherein said base unit, said first system and said second system include guide means, said interlocking means being located adjacent said guide means
115 when said first system and said second system are mounted on said base unit.
6. The facsimile apparatus of Claim 5 wherein said guide means include a track carried by said base unit, a switch carried by said base unit, a
120 member received by said track carried on said first sheet feeding system and said second sheet feeding system and a means cooperating with said switch means carried on said first system and said second system.
7. Facsimile apparatus as claimed in Claim 2, wherein said guide means are inclined when said
125 base unit rests on a horizontal plane.
8. Facsimile apparatus as claimed in Claim 7, wherein said guide means include at least one

inclined track carried by said base unit.

9. Facsimile apparatus as claimed in Claim 1,
wherein said first configuration of said first system
includes means for feeding a single sheet to said
5 system.

10. Facsimile apparatus as claimed in Claim 9,
wherein said second configuration of said second

system includes means for feeding a plurality of
sheets stored in said second system.

10 11. Facsimile apparatus as claimed in Claim 10,
wherein said feeding means includes cassette
means removable from said second system.

12. Facsimile apparatus as claimed in Claim 1
and substantially as herein described.

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